DOCUMENT RESUME

ED 041 337 CG 005 677

AUTHOR Pugh, Richard C.; And Others
TITLE Indiana Studies in Prediction. Number 13. Predicting Success for Indiana University Freshmen Using the CEEB Achievement Tests, the CEEB Scholastic Aptitude Test, and High School Rank.
INSTITUTION Indiana Univ., Bloomington. Bureau of Educational Studies and Testing.
PUB DATE Apr 70
NOTE 46p.

EDRS PRICE EDRS Price MF-$0.25 HC-$2.40
DESCRIPTORS Academic Achievement, *Achievement Tests, *College Freshmen, *Grade Point Average, *Prediction, *Predictive Ability (Testing), Predictive Measurement, Standardized Tests, Test Results, Tests

ABSTRACT

The primary aim of this study was to determine whether College Entrance Examination Board (CEEB) Achievement Test results provide additional information for the prediction of academic success beyond the normal data accumulated. The study presents two types of evidence: (1) a prediction of first semester grade point averages (GPA), and (2) a prediction of grades obtained in 29 selected courses which typically carry high freshmen enrollments. Data was obtained from freshmen who entered Indiana University in the fall semester of 1968. Results showed that not all of the tests were useful in predicting course marks. The mixed results obtained in this study suggest a thoughtful review of the practice of requiring CEEB Achievement Tests for admission to the University. In many instances very little significant prediction information is added to that already available from scholastic aptitude test results and high school rank. (Author/KJ)

CG 005 671

ED041337

INDIANA UNIVERSITY / 1970

Predicting Success for Indiana University Freshmen Using the CEEB Achievement Tests, the CEEB Scholastic Aptitude Test, & High School Rank

INDIANA STUDIES IN PREDICTION

NUMBER THIRTEEN

CG 005 677

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

MONOGRAPH OF THE
Bureau of Educational Studies and Testing

ED041337

INDIANA STUDIES IN PREDICTION No. 13

PREDICTING SUCCESS FOR INDIANA UNIVERSITY FRESHMEN USING THE CEEB ACHIEVEMENT TESTS, THE CEEB SCHOLASTIC APTITUDE TEST, AND HIGH SCHOOL RANK

by

Richard C. Pugh
James M. Morgan
H. Glenn Ludlow

Monograph of the

Bureau of Educational Studies
and Testing

INDIANA UNIVERSITY

April, 1970

TABLE OF CONTENTS

	Page
DESIGN	1
RESULTS	3
Prediction of First Semester GPA	3
Using the SAT and HSR only	3
Using the English Composition Achievement Test, HSR, and SAT	5
Using the American History Achievement Test, HSR, and SAT	8
Prediction of Course Grades	11
Using the English Composition Achievement Test to predict grades in	11
English W131	11
English L101	14
Speech S121	16
Psychology P101	18
Education F100	20
Using the American History Achievement Test to predict grades in	22
History H105	22
Sociology S161	25
Using the Chemistry Achievement Test to predict grades in	27
Chemistry C101	27
Chemistry C105	30
Using the Biology Achievement Test to predict grades in	32
Biology B100	32
Anatomy A210	34
Zoology Z103	34
Using the Literature Achievement Test to predict grades in	35
English L101	35
SUMMARY	37

LIST OF TABLES

Table		Page
1.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using First Semester GPA as the Criterion With SAT and HSR as Predictor Variables	3
2.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using First Semester GPA as the Criterion With SAT and HSR as Predictor Variables	4
3.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using First Semester GPA as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	6
4.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using First Semester GPA as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	7
5.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using First Semester GPA as the Criterion With SAT, HSR, and the American History Test as Predictor Variables .	9
6.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using First Semester GPA as the Criterion With SAT, HSR, and the American History Test as Predictor Variables .	10
7.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using Grade Earned in English W131 as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	12
8.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using Grade Earned in English W131 as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	13

LIST OF TABLES (Cont'd)

Table		Page
9.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using Grade Earned in English L101 as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	14
10.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using Grade Earned in English L101 as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	15
11.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using Grade Earned in Speech S121 as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	16
12.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using Grade Earned in Speech S121 as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	17
13.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using Grade Earned in Psychology P101 as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	18
14.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using Grade Earned in Psychology P101 as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	19
15.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using Grade Earned in Education F100 as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	20

LIST OF TABLES (Cont'd)

Table		Page
16.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using Grade Earned in Education F100 as the Criterion With SAT, HSR, and the English Composition Test as Predictor Variables	21
17.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using Grade Earned in History H105 as the Criterion With SAT, HSR, and the American History Test as Predictor Variables	23
18.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using Grade Earned in History H105 as the Criterion With SAT, HSR, and the American History Test as Predictor Variable	24
19.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using Grade Earned in Sociology S161 as the Criterion With SAT, HSR, and the American History Test as Predictor Variables	25
20.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using Grade Earned in Sociology S161 as the Criterion With SAT, HSR, and the American History Test as Predictor Variables	26
21.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using Grade Earned in Chemistry C101 as the Criterion With SAT, HSR, and the Chemistry Test as Predictor Variables .	28
22.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using Grade Earned in Chemistry C101 as the Criterion With SAT, HSR, and the Chemistry Test as Predictor Variables .	29
23.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using Grade Earned in Chemistry C105 as the Criterion With SAT, HSR, and the Chemistry Test as Predictor Variables .	30

LIST OF TABLES (Cont'd)

Table		Page
24.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using Grade Earned in Chemistry C105 as the Criterion With SAT, HSR, and the Chemistry Test as Predictor Variables .	31
25.	Zero-Order and Multiple Correlation Coefficients for Freshman Men Using Grade Earned in Biology B100 as the Criterion With SAT, HSR, and the Biology Achievement Test as Predictor Variables	32
26.	Zero-Order and Multiple Correlation Coefficients for Freshman Women Using Grade Earned in Biology B100 as the Criterion With SAT, HSR, and the Biology Achievement Test as Predictor Variables	33
27.	Zero-Order Correlation Coefficients for Freshman Men and Women of Grade Earned in Anatomy A210 and Zoology Z103 With SAT, HSR, and the Biology Achievement Test as Predictor Variables	34
28.	Zero-Order Correlation Coefficients for Freshman Men and Women of Grade Earned in English L101 With SAT, HSR, and the Literature Achievement Test as Predictor Variables	36

INDIANA STUDIES IN PREDICTION: No. 13

PREDICTING SUCCESS FOR INDIANA UNIVERSITY FRESHMEN USING THE CEEB ACHIEVEMENT TESTS, THE CEEB SCHOLASTIC APTITUDE TEST, AND HIGH SCHOOL RANK

The Bureau of Educational Studies and Testing was requested in the fall of 1968 by the Junior Division of Indiana University to determine the information gained from the College Entrance Examination Board (CEEB) Achievement Tests in predicting success of university freshmen. More specifically, the Bureau was requested to study the contribution which the information from the CEEB Achievement Tests contributed to the estimation of first semester grades.

The entering freshman students of the fall, 1968, were selected for the study. These students had been requested by the Junior Division to report three CEEB Achievement Test scores along with the traditionally required CEEB Scholastic Aptitude Test scores and High School Rank (HSR).

DESIGN

The design of this study consisted of using the CEEB Achievement Test scores as predictor variables in estimating the first semester GPA and final grades in selected courses. The CEEB Scholastic Aptitude Test (SAT) and HSR were used as primary (high priority) predictor variables and the CEEB Achievement Tests were used as secondary (lower priority) predictor variables in order to determine the additional variance accounted for by the CEEB Achievement Tests. It was assumed that the CEEB Achievement Tests would give information beyond that provided by the SAT and HSR.

The first semester grade point average (GPA) was used as one criterion variable and the grades in 29 selected courses which typically had high freshmen enrollment were considered to be additional criterion variables. These selected courses were:

Anatomy A210	History H103
Anthropology A103	History H105
Astronomy A100	Linguistics L103
Biology B100	Mathematics M115
Business W100	Mathematics M117
Chemistry C101	Mathematics M215
Chemistry C105	Music M174
Education F100	Philosophy P100
English W131	Psychology P101
English L101	Sociology S161
French F101	Spanish S101
French F201	Spanish S203
Geography G107	Speech S121
Geology G100	Zoology Z103
German G101	

The method of analysis selected for use in this study was multiple correlation. In all of the analyses, three multiple correlations were computed--namely: (1) equal priority was given to all variables; (2) equal priority was given to HSR, SAT Verbal score (SAT V), and SAT Mathematics score (SAT M) with lower priority to the CEEB Achievement Tests; and (3) equal priority was given to HSR and SAT Sum score (SAT V + SAT M scores) with lower priority given to the CEEB Achievement Tests. The multiple correlations were computed separately for men and women.

The students were given the option of selecting any three of the CEEB Achievement Tests but were strongly urged to include the English Composition Achievement Test in their selection. As a result, the multiple correlations are based on different groups of students depending on whether the necessary predictor and criterion variable scores were available for the students selected. The students might have reported any three of the following CEEB Achievement Test scores:

English Composition
Chemistry
American History
European History
Biology
French Reading
German Reading
Spanish Reading
Mathematics I
Literature
Physics
Latin Reading

RESULTS

Prediction of First Semester GPA

The first criterion variable studied was first semester GPA. The GPA was predicted first, with the HSR and SAT; secondly, with the HSR, SAT, and the English Composition Achievement Test; and thirdly, by the HSR, SAT SUM, and the American History Achievement Test.

Using the SAT and HSR only

First, the results for predicting the GPA without any achievement test scores will be presented. In Table 1 the zero-order correlation coefficients, multiple correlation coefficients and the increase in variance accounted for at each step in the stepwise regression procedure[1] are given for men.

TABLE 1. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING FIRST SEMESTER GPA AS THE CRITERION WITH SAT AND HSR AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 2063)

	SAT VERBAL	SAT MATH	HIGH SCHOOL RANK	SAT SUM
GPA	.374	.412	-.467	.442

MULTIPLE CORRELATIONS (N = 2063)

			GPA R	GPA Increase in R^2
1.	Equal priority to all variables:	HSR	.467	.2184
		SAT SUM	.529	.0612
		SAT V	.529	.0000
2.	Equal priority to HSR, SAT V, SAT M:	HSR	.467	.2184
		SAT M	.515	.0470
		SAT V	.529	.0142
3.	Equal priority to HSR and SAT SUM:	HSR	.467	.2184
		SAT SUM	.529	.0612

[1] A stepwise multiple regression technique was used. That is, given the priorities assigned to each of the predictor variables, selection was based on the greatest reduction of criterion score variance which had not been accounted for at each step.

The highest single predictor of GPA for men was HSR which correlated -.467 with the first semester GPA. The SAT SUM correlated next highest with a coefficient of .442. The weighted combination of HSR, SAT V, and SAT M gave a multiple correlation of .529. This multiple correlation was the same as the multiple correlation found from the weighted combination of HSR and SAT SUM. That is, approximately 28 per cent of the GPA variance was accounted for by HSR and SAT SUM whether the SAT V and SAT M were weighted differentially or arithmetically.

Similar information is presented in Table 2 for women. Complete data were found for 2,054 women.

TABLE 2. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING FIRST SEMESTER GPA AS THE CRITERION WITH SAT AND HSR AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 2054)

	SAT VERBAL	SAT MATH	HIGH SCHOOL RANK	SAT SUM
GPA	.437	.468	-.489	.505

MULTIPLE CORRELATIONS (N = 2054)

			GPA R	GPA Increase in R^2
1.	Equal priority to all variables:	SAT SUM	.505	.2551
		HSR	.579	.0811
		SAT V	.580	.0004
2.	Equal priority to HSR, SAT V, SAT M:	HSR	.489	.2390
		SAT M	.564	.0786
		SAT V	.580	.0190
3.	Equal priority to HSR and SAT SUM:	SAT SUM	.505	.2551
		HSR	.579	.0811

The highest single predictor variable of GPA for the women was SAT SUM which correlated .505 with the GPA criterion. The next highest predictor variable for the women was HSR which correlated -.489 with GPA. When used in weighted combination HSR, SAT M, and SAT V correlated .580 with GPA. The weighted

combination of SAT SUM and HSR correlated .579 with GPA, approximately the same correlation as the weighted combination of HSR, SAT M, and SAT V. Regardless of which weighted combination was used, approximately 33.6 per cent of the GPA variance was accounted for.

In summary, the weighted combination of HSR and SAT SUM was considered to be the best combination of variables to use for predicting GPA for both men and women. Virtually nothing was gained by differentially weighting SAT M and SAT V as opposed to the straight arithmetic addition of the two scores.

Using the English Composition Achievement Test, HSR, and SAT

Since considerable GPA criterion variance was unaccounted for by the SAT SUM and HSR, the CEEB Achievement Tests were considered to be potential variables which would account for additional GPA variance.

The CEEB Achievement Test which was taken by the most students was English Composition. The English Composition Test scores along with HSR and SAT scores were available for 1,651 freshman men. The correlation coefficients based on these 1,651 students are reported in Table 3 with GPA used as the criterion measure.

TABLE 3. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING FIRST SEMESTER GPA AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 1651)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
GPA	.375	.398	.419	-.480	.438

MULTIPLE CORRELATIONS (N = 1651)

		GPA R	GPA Increase in R^2
1. Equal priority to all variables:	HSR	.480	.2302
	SAT SUM	.535	.0558
	ENG C	.543	.0086
	SAT V	.543	.0002
2. Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	HSR	.480	.2302
	SAT V	.525	.0457
	SAT M	.535	.0105
	ENG C	.543	.0083
3. Equal priority to HSR and SAT SUM; lower priority to ENG C:	HSR	.480	.2302
	SAT SUM	.535	.0558
	ENG C	.543	.0086

The highest single predictor of GPA was HSR with a correlation coefficient of -.480. The second highest predictor was SAT SUM with a coefficient of .438 followed by English Composition with a coefficient of .419.

Three different multiple correlations were computed in order to study the contribution to variance accounted for by the English Composition Test. The first multiple correlation showed that the English Composition Test accounted for an additional 0.86 per cent of the GPA variance over the weighted combination of HSR and SAT SUM. By differentially weighting SAT V and SAT M a second multiple correlation was computed. The English Composition Test was found to account for an additional 0.83 per cent of the criterion variance when it was

combined with HSR, SAT V, and SAT M. In essence, the CEEB English Composition Test accounted for less than one per cent additional GPA variance when added to HSR and SAT SUM. Virtually no new information was gained from the English Composition Test in predicting first semester GPA for men.

The English Composition Test scores were available for 1,702 women, who also had HSR and SAT scores, in the 1968 entering freshman class. The variance accounted for by the English Composition Test for the entering women was determined by correlation coefficients and reported in Table 4. It must be remembered that the correlation coefficients in Table 4 are based on a group of students who had reported English Composition scores.

TABLE 4. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING FIRST SEMESTER GPA AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 1702)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
GPA	.439	.461	.488	-.504	.504

MULTIPLE CORRELATIONS (N = 1702)

			GPA R	GPA Increase in R^2
1.	Equal priority to all variables:	HSR	.504	.2541
		SAT SUM	.584	.0874
		ENG C	.595	.0122
		SAT V	.597	.0022
2.	Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	HSR	.504	.2541
		SAT M	.566	.0667
		SAT V	.584	.0207
		ENG C	.597	.0143
3.	Equal priority to HSR AND SAT SUM; lower priority to ENG C:	HSR	.504	.2541
		SAT SUM	.584	.0874
		ENG C	.595	.0122

The HSR and SAT SUM were the highest single predictors of GPA. A correlation coefficient of -.504 was found for HSR and a correlation coefficient of .504 was found for SAT SUM. The English Composition Achievement Test correlated .488 with first semester GPA.

Assigning equal priority to all the predictor variables, the English Composition Test was found to account for 1.22 per cent of the GPA criterion variance in addition to the variance accounted for by the HSR and SAT SUM. By differentially weighting SAT M and SAT V, the English Composition Test was found to account for 1.43 per cent additional GPA variance. The English Composition Test was found to contribute very slightly to the prediction of first semester GPA when used in weighted combination with HSR and SAT SUM.

In summary, the English Composition Test did not seem to provide much additional information in estimating first semester GPA's for women. The slight increase in variance accounted for (1.22 to 1.43 per cent) did not seem to justify the use of the English Composition Test score in estimating first semester GPA's for either men or women.

Using the American History Achievement Test, HSR, and SAT

The American History Test had also been taken by a sufficient number of students to permit an analysis of its contribution to the prediction of first semester GPA. The analysis was made by computing zero-order and multiple correlation coefficients for men and women, separately. The coefficients based on 810 men are reported in Table 5.

TABLE 5. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING FIRST SEMESTER GPA AS THE CRITERION WITH SAT, HSR, AND THE AMERICAN HISTORY TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 810)

	SAT VERBAL	SAT MATH	AMERICAN HISTORY	HIGH SCHOOL RANK	SAT SUM
GPA	.391	.398	.370	-.444	.447

MULTIPLE CORRELATIONS (N = 810)

			GPA R	GPA Increase in R^2
1.	Equal priority to all variables:	SAT SUM	.447	.1999
		HSR	.519	.0699
		AM HIST	.523	.0037
		SAT V	.523	.0001
2.	Equal priority to HSR, SAT V, SAT M; lower priority to AM HIST:	HSR	.444	.1972
		SAT V	.508	.0605
		SAT M	.520	.0130
		AM HIST	.523	.0029
3.	Equal priority to HSR and SAT SUM; lower priority to AM HIST:	SAT SUM	.447	.1999
		HSR	.519	.0699
		AM HIST	.523	.0037

The highest single predictor of GPA for this group of men was SAT SUM (r = .447) followed closely by HSR (r = -.444). The American History Test had a zero-order correlation coefficient of .370 with GPA.

By assigning equal priority to all the predictor variables a multiple correlation coefficient of .523 with GPA was found. The weighted combination of SAT SUM and HSR accounted for 26.98 per cent of the GPA variance with the American History Test contributing less than one per cent (0.37 per cent). When the American History Test was assigned a relatively lower priority, its contribution to criterion variance accounted for remained less than one per cent. The SAT and HSR seemed to contribute substantially to the prediction of first semester

GPA but the American History Test failed to provide much additional help.

American History Test scores were available for 774 freshman women who had SAT and HSR data. The correlation coefficients of these predictor variables with first semester GPA are shown in Table 6.

TABLE 6. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING FIRST SEMESTER GPA AS THE CRITERION WITH SAT, HSR, AND THE AMERICAN HISTORY TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 774)

	SAT VERBAL	SAT MATH	AMERICAN HISTORY	HIGH SCHOOL RANK	SAT SUM
GPA	.404	.382	.466	-.512	.442

MULTIPLE CORRELATIONS (N = 774)

			GPA R	GPA Increase in R^2
1.	Equal priority to all variables:	HSR	.512	.2622
		AM HIST	.581	.0755
		SAT SUM	.586	.0062
		SAT V	.587	.0004
2.	Equal priority to HSR, SAT V, SAT M; lower priority to AM HIST:	HSR	.512	.2622
		SAT V	.556	.0474
		SAT M	.563	.0074
		AM HIST	.587	.0273
3.	Equal priority to HSR and SAT SUM; lower priority to AM HIST:	HSR	.512	.2622
		SAT SUM	.562	.0539
		AM HIST	.586	.0278

High School Rank was the highest single predictor of GPA for these women (r = -.512). The American History Test correlated next highest (r = .466), followed by SAT SUM with a correlation of .442.

All the predictor variables were assigned equal priority and a multiple correlation coefficient was computed in a stepwise manner. The HSR accounted for 26.22 per cent of the GPA variance, the American History Test accounted for an additional 7.55 per cent, and the SAT SUM an additional 0.62 per cent.

Two other multiple correlations were computed in which the American History Test was assigned a relatively lower priority in order to help assess the additional information gained from the test. In one of the multiple correlations HSR, SAT V, and SAT M were given equal priority and the American History Test was given a lower priority. The additional variance accounted for by the test over the variance accounted for by HSR, SAT V, and SAT M was 2.73 per cent. When higher priority was assigned to HSR and SAT SUM, the American History Test was found to explain an additional 2.78 per cent of GPA variance. In either multiple correlation, the American History Test reduced the unexplained criterion variance by no more than 2.8 per cent--a small contribution.

Prediction of Course Grades

Using the English Composition Achievement Test to predict grades

In further analyses of the achievement tests, correlation coefficients were computed using course grades as criterion variables. The first analysis of an achievement test is based on the English Composition Test.

English W131. Sufficient available data and significant zero-order correlation coefficients between the English Composition Test and course grades were found for five courses--English W131, English L101, Education F100, Psychology P101, and Speech S121. The correlation coefficients were computed separately for both sexes and are reported in Tables 7-16. The correlation coefficients between the English Composition Test and course grades in English W131 are reported in Tables 7 and 8. English W131 is a course in freshman composition with the following description from the College of Arts and Sciences Bulletin.

> "Progresses from practice of simple description, narration, and exposition to practice of persuasion and documentation in support of a thesis."

TABLE 7. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING GRADE EARNED IN ENGLISH W131 AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 634)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
ENGLISH W131	.367	.299	.358	-.311	.387

MULTIPLE CORRELATIONS (N = 634)

			R	ENGLISH W131 Increase in R^2
1.	Equal priority to all variables:	SAT SUM	.387	.1494
		HSR	.419	.0264
		ENG C	.437	.0155
		SAT V	.445	.0065
2.	Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	SAT V	.367	.1346
		HSR	.430	.0504
		SAT M	.435	.0042
		ENG C	.445	.0086
3.	Equal priority to HSR and SAT SUM; lower priority to ENG C:	SAT SUM	.387	.1494
		HSR	.419	.0264
		ENG C	.437	.0155

TABLE 8. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING GRADE EARNED IN ENGLISH W131 AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 675)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
ENGLISH W131	.257	.220	.361	-.219	.278

MULTIPLE CORRELATIONS (N = 675)

			R	ENGLISH W131 Increase in R^2
1.	Equal priority to all variables:	ENG C	.361	.1304
		HSR	.381	.0150
		SAT V	.382	.0008
		SAT M	.383	.0001
2.	Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	SAT V	.257	.0660
		HSR	.304	.0264
		SAT M	.312	.0051
		ENG C	.383	.0489
3.	Equal priority to HSR and SAT SUM; lower priority to ENG C:	SAT SUM	.278	.0773
		HSR	.306	.0165
		ENG C	.382	.0524

For both men and women a significant positive correlation was found between the English Composition Test scores and English W131 grades. They were .358 for men and .361 for women. The amount of additional information gained from the English Composition Test was evaluated by determining the amount of additional variance accounted for over the variance accounted for by the SAT and HSR. For men it was found to be less than 2 per cent and for women it was found to be 5 per cent additional variance accounted for. Whereas the contribution for the English Composition Test was insignificant for men, the English Composition Test did contribute significantly to the prediction of grades in English W131 for women. In essence, the English Composition Test appears to be a useful predictor in addition to the usual SAT and HSR for women in English W131.

English L101. The English Composition Test was correlated with grades in English L101. English L101 is a freshman literature course and has the following description in the Bulletin of the College of Arts and Sciences.

> "Literary masterpieces from Homer to the present. Aims to teach thoughtful, intensive reading, to introduce students to aesthetic values in literature, and to make students aware of the enjoyment of reading."

These correlation coefficients were computed separately for men and women and are reported in Tables 9 and 10 respectively.

TABLE 9. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING GRADE EARNED IN ENGLISH L101 AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 319)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
ENGLISH L101	.359	.201	.334	-.336	.320

MULTIPLE CORRELATIONS (N = 319)

			R	ENGLISH L101 Increase in R^2
1.	Equal priority to all variables:	SAT V	.359	.1287
		HSR	.430	.0566
		SAT M	.434	.0032
		ENG C	.439	.0041
2.	Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	SAT V	.359	.1287
		HSR	.430	.0566
		SAT M	.434	.0032
		ENG C	.439	.0041
3.	Equal priority to HSR and SAT SUM; lower priority to ENG C:	HSR	.336	.1128
		SAT SUM	.390	.0394
		ENG C	.412	.0175

TABLE 10. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING GRADE EARNED IN ENGLISH L101 AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 574)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
ENGLISH L101	.453	.345	.450	-.425	.450

MULTIPLE CORRELATIONS (N = 574)

			R	ENGLISH L101 Increase in R^2
1.	Equal priority to all variables:	SAT V	.453	.2052
		HSR	.528	.0732
		ENG C	.538	.0116
		SAT M	.539	.0000
2.	Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	SAT V	.453	.2052
		HSR	.528	.0732
		SAT M	.528	.0008
		ENG C	.529	.0108
3.	Equal priority to HSR and SAT SUM; lower priority to ENG C:	SAT SUM	.450	.2024
		HSR	.512	.0594
		ENG C	.530	.0195

The English Composition Test correlated significantly with grades in English L101 for men and women--.334 for men and .450 for women. These correlation coefficients were approximately the same as were found for SAT and HSR.

The amount of additional variance accounted for by the English Composition Test was no more than 2 per cent, assuming SAT and HSR to have a higher priority. This amount of additional variance accounted for was considered to be too small to warrant the use of the English Composition Test in predicting English L101 grades.

Speech S121. The English Composition Test was correlated with grades received in Speech S121. This course is usually taken by many freshmen to meet any of several requirements. The description of Speech S121 found in the College of Arts and Sciences Bulletin is:

> "Theory and practice of public speaking: training in thought processes necessary to organize speech content; analysis of components of effective delivery and language."

The correlation coefficients of the English Composition Test with grades in Speech S121 are reported for men and women in Tables 11 and 12.

TABLE 11. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING GRADE EARNED IN SPEECH S121 AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 417)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
SPEECH S121	.259	.178	.347	-.281	.252

MULTIPLE CORRELATIONS (N = 417)

			R	SPEECH S121 Increase in R^2
1.	Equal priority to all variables:	ENG C	.347	.1200
		HSR	.379	.0230
		SAT V	.381	.0010
2.	Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	HSR	.281	.0790
		SAT V	.339	.0360
		SAT M	.340	.0000
		ENG C	.383	.0320
3.	Equal priority to HSR and SAT SUM; lower priority to ENG C:	HSR	.281	.0790
		SAT SUM	.320	.0240
		ENG C	.379	.0410

TABLE 12. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING GRADE EARNED IN SPEECH S121 AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 158)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
SPEECH S121	.364	.172	.259	.063	.302

MULTIPLE CORRELATIONS (N = 158)

			R	SPEECH S121 Increase in R^2
1.	Equal priority to all variables:	SAT V	.364	.1330
		HSR	.371	.0050
		ENG C	.373	.0010
2.	Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	SAT V	.364	.1330
		HSR	.371	.0050
		SAT M	.371	.0000
		ENG C	.373	.0010
3.	Equal priority to HSR and SAT SUM; lower priority to ENG C:	SAT SUM	.302	.0910
		HSR	.331	.0190
		ENG C	.347	.0110

The English Composition Test correlated .347 with Speech S121 grades for men and .259 for women. These correlation coefficients were significant but were low.

The amount of additional variance accounted for by the English Composition Test was approximately 3 to 4 per cent for men and approximately one per cent for women. The contribution for men was considered to be sufficiently high for the test to be of some use in predicting grades for men. This is not however the case for women in Speech S121.

Psychology P101. The next course selected for analyzing the English Composition Test was Psychology P101. This course is described in the College of Arts and Sciences Bulletin as follows:

> "Introduction to psychology; its methods, data, and theoretical interpretations in areas of learning, sensory psychology, and psychophysiology."

The correlation coefficients of the English Composition Test with grades in Psychology P101 are given in Tables 13 and 14.

TABLE 13. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING GRADE EARNED IN PSYCHOLOGY P101 AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 543)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
PSYCHOLOGY P101	.366	.322	.390	-.349	.399

MULTIPLE CORRELATIONS (N = 543)

		PSYCHOLOGY P101 R	PSYCHOLOGY P101 Increase in R^2
1. Equal priority to all variables:	SAT SUM	.399	.1594
	HSR	.451	.0443
	ENG C	.464	.0115
	SAT M	.466	.0017
2. Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	SAT V	.366	.1341
	HSR	.449	.0671
	SAT M	.458	.0081
	ENG C	.466	.0076
3. Equal priority to HSR and SAT SUM; lower priority to ENG C:	SAT SUM	.399	.1594
	HSR	.451	.0443
	ENG C	.464	.0115

TABLE 14. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING GRADE EARNED IN PSYCHOLOGY P101 AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 678)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
PSYCHOLOGY P101	.393	.413	.422	-.455	.464

MULTIPLE CORRELATIONS (N = 678)

		PSYCHOLOGY P101		
			R	Increase in R^2
1.	Equal priority to all variables:	SAT SUM	.464	.2148
		HSR	.543	.0805
		ENG C	.550	.0073
		SAT V	.551	.0010
2.	Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	HSR	.455	.2065
		SAT M	.520	.0642
		SAT V	.544	.0246
		ENG C	.551	.0084
3.	Equal priority to HSR and SAT SUM; lower priority to ENG C:	SAT SUM	.464	.2148
		HSR	.543	.0805
		ENG C	.550	.0073

The correlation coefficients between the English Composition Test and grades in Psychology P101 were significant--.390 for men and .422 for women. The relation between the English Composition Test and Psychology P101 was further studied by computing multiple correlations.

Assigning a higher priority to SAT and HSR, the English Composition Test was found to account for approximately one per cent additional variance for both men and women. That is, the amount of additional information gained from the English Composition Test in predicting Psychology P101 grades was very small.

Education F100. The fifth course selected for studying the English Composition Test was Education F100. This freshmen level course is described in the Bulletin of the School of Education as follows:

> "The function of public education in society and of teaching as a profession. Study of the desired competencies in teaching; evaluation of one's own capacities, interests, and abilities; and planning of one's professional career."

The correlation coefficients between the English Composition Test and grades in Education F100 are reported in Tables 15 and 16.

TABLE 15. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING GRADE EARNED IN EDUCATION F100 AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 98)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
EDUCATION F100	.307	.197	.324	-.220	.294

MULTIPLE CORRELATIONS (N = 98)

			EDUCATION F100 R	EDUCATION F100 Increase in R^2
1.	Equal priority to all variables:	ENG C	.324	.1050
		SAT V	.339	.0101
		HSR	.344	.0035
2.	Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	SAT V	.307	.0940
		HSR	.325	.0117
		SAT M	.327	.0015
		ENG C	.344	.0114
3.	Equal priority to HSR and SAT SUM; lower priority to ENG C:	SAT SUM	.294	.0864
		HSR	.306	.0073
		ENG C	.335	.0183

TABLE 16. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING GRADE EARNED IN EDUCATION F100 AS THE CRITERION WITH SAT, HSR, AND THE ENGLISH COMPOSITION TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 386)

	SAT VERBAL	SAT MATH	ENGLISH COMPOSITION	HIGH SCHOOL RANK	SAT SUM
EDUCATION F100	.465	.342	.399	-.132	.452

MULTIPLE CORRELATIONS (N = 386)

			EDUCATION F100	
			R	Increase in R^2
1.	Equal priority to all variables:	SAT V	.465	.2161
		HSR	.487	.0211
		SAT M	.491	.0038
		ENG C	.492	.0012
2.	Equal priority to HSR, SAT V, SAT M; lower priority to ENG C:	SAT V	.465	.2161
		HSR	.487	.0211
		SAT M	.491	.0038
		ENG C	.492	.0012
3.	Equal priority to HSR and SAT SUM; lower priority to ENG C:	SAT SUM	.452	.2046
		HSR	.466	.0125
		ENG C	.470	.0041

Although there was a significant correlation between the English Composition Test and grades in Education F100 (.324 for men and .399 for women) very little additional information was gained from the test over what was found from the SAT and HSR. Less than 2 per cent additional variance was accounted for by the English Composition Test for men and women. This amount of additional information was considered to be trivial.

Using the American History Achievement Test to predict grades

The American History Achievement Test scores were correlated with course grades in American History H105 and Sociology S161. These were the only courses for which sufficient data were available and in which zero order correlations were sufficiently high to justify an analysis.

History H105. Course grades in American History H105 were correlated with the American History Achievement Test scores. The American History H105 course is described in the College of Arts and Sciences Bulletin as follows:

> "I. Colonial period, Revolution, Confederation and Constitution, National period to 1865. II. 1865 to present. Political history forms framework, with economic, social, cultural, and intellectual history interwoven. Introduction to historical literature, source material, and criticism."

Correlation coefficients were determined for both sexes and are reported in Tables 17 and 18.

TABLE 17. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING GRADE EARNED IN HISTORY H105 AS THE CRITERION WITH SAT, HSR, AND THE AMERICAN HISTORY TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 195)

	SAT VERBAL	SAT MATH	AMERICAN HISTORY	HIGH SCHOOL RANK	SAT SUM
HISTORY H105	.381	.257	.484	-.276	.363

MULTIPLE CORRELATIONS (N = 195)

			R	HISTORY H105 Increase in R^2
1.	Equal priority to all variables:	AM HIST	.484	.2338
		HSR	.495	.0112
		SAT V	.502	.0066
		SAT M	.502	.0002
2.	Equal priority to HSR, SAT V, SAT M; lower priority to AM HIST:	SAT V	.381	.1448
		HSR	.411	.0244
		SAT M	.412	.0002
		AM HIST	.502	.0824
3.	Equal priority to HSR and SAT SUM; lower priority to AM HIST:	SAT SUM	.363	.1320
		HSR	.379	.0114
		AM HIST	.498	.1042

TABLE 18. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING GRADE EARNED IN HISTORY H105 AS THE CRITERION WITH SAT, HSR, AND THE AMERICAN HISTORY TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 100)

	SAT VERBAL	SAT MATH	AMERICAN HISTORY	HIGH SCHOOL RANK	SAT SUM
HISTORY H105	.367	.233	.446	-.310	.352

MULTIPLE CORRELATIONS (N = 100)

			R	HISTORY H105 Increase in R^2
1.	Equal priority to all variables:	AM HIST	.446	.1987
		HSR	.480	.0314
		SAT V	.487	.0074
		SAT M	.488	.0008
2.	Equal priority to HSR, SAT V, SAT M; lower priority to AM HIST:	SAT V	.367	.1343
		HSR	.428	.0492
		SAT M	.428	.0000
		AM HIST	.488	.0549
3.	Equal priority to HSR and SAT SUM; lower priority to AM HIST:	SAT SUM	.352	.1239
		HSR	.400	.0363
		AM HIST	.482	.0722

Significant positive correlation coefficients were found between the grades in American History H105 and the scores on the American History Test. For men a correlation coefficient of .484 was found; for women, a coefficient of .446.

In determining the additional variance accounted for in History H105 grades, the American History Test was assigned a lower priority than the SAT and HSR. For both men and women a substantial amount of additional variance was accounted for by the American History Test. For men, approximately 8-10 per cent additional variance was accounted for and for women an additional 5-7 per cent was accounted for. The contributions of the American History Test were considered to be more than trivial and sufficient to justify the use of the American History Test in estimating progress in History H105.

Sociology S161. The American History Test scores also were correlated with grades in Sociology S161. Sociology S161 is described in the College of Arts and Sciences Bulletin as follows:

> "Nature of interpersonal relationships, societies, groups, communities, and institutional areas such as the family, industry, and religion; social process operating within these areas; significance for problems of personality, human nature, social disorganization, and social change."

Correlation coefficients between the scores on the American History Test and grades in Sociology S161 are given for both sexes in Tables 19 and 20.

TABLE 19. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING GRADE EARNED IN SOCIOLOGY S161 AS THE CRITERION WITH SAT, HSR, AND THE AMERICAN HISTORY TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 160)

	SAT VERBAL	SAT MATH	AMERICAN HISTORY	HIGH SCHOOL RANK	SAT SUM
SOCIOLOGY S161	.439	.307	.402	-.267	.426

MULTIPLE CORRELATIONS (N = 160)

			SOCIOLOGY S161	
			R	Increase in R^2
1.	Equal priority to all variables:	SAT V	.439	.1929
		HSR	.468	.0256
		AM HIST	.477	.0087
		SAT M	.477	.0002
2.	Equal priority to HSR, SAT V, SAT M; lower priority to AM HIST:	SAT V	.439	.1929
		HSR	.468	.0256
		SAT M	.468	.0007
		AM HIST	.477	.0082
3.	Equal priority to HSR and SAT SUM; lower priority to AM HIST:	SAT SUM	.426	.1815
		HSR	.436	.0084
		AM HIST	.458	.0198

TABLE 20. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING GRADE EARNED IN SOCIOLOGY S161 AS THE CRITERION WITH SAT, HSR, AND THE AMERICAN HISTORY TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 263)

	SAT VERBAL	SAT MATH	AMERICAN HISTORY	HIGH SCHOOL RANK	SAT SUM
SOCIOLOGY S161	.531	.440	.521	-.440	.548

MULTIPLE CORRELATIONS (N = 263)

			SOCIOLOGY S161	
			R	Increase in R^2
1.	Equal priority to all variables:	SAT SUM	.548	.3006
		HSR	.597	.0557
		AM HIST	.628	.0377
		SAT M	.632	.0050
2.	Equal priority to HSR, SAT V, SAT M; lower priority to AM HIST:	SAT V	.531	.2820
		HSR	.604	.0833
		SAT M	.611	.0078
		AM HIST	.632	.0258
3.	Equal priority to HSR and SAT SUM; lower priority to AM HIST:	SAT SUM	.548	.3006
		HSR	.597	.0557
		AM HIST	.628	.0377

Grades in Sociology S161 correlated .402 for men and .521 for women with American History Test scores. Because of these rather substantial relationships, multiple correlation coefficients were computed to determine the amount of additional variance accounted for by the American History Test.

For men, the amount of additional variance accounted for over the contribution of the SAT and HSR was less than 2 per cent. For women, it ranged from 2.58 to 3.77 per cent depending upon whether the SAT V and SAT M were differentially weighted or added arithmetically. The contribution for men was considered to be insignificant; for women the contribution was slightly higher.

Using the Chemistry Achievement Test to predict grades

The Chemistry Achievement Test was evaluated in terms of two introductory chemistry courses open to freshmen: C101, which has no mathematics prerequisite; and C105, which has a prerequisite of two years of high school algebra. Course descriptions from the College of Arts and Sciences Bulletin are as follows:

> "C101. Essential principles of chemistry. When followed by C102, satisfies programs that require only two semesters of chemistry. Admission to advanced courses on basis of C101-C102 granted only in exceptional cases. Lectures, recitation, laboratory."
>
> "C105. P: two years of high school algebra or Mathematics M117, which may be taken concurrently; placement examination or 13 hours of College credit. Basic principles, including stoichiometry, equilibrium, atomic and molecular structure. Lectures, recitation, laboratory. Credit not given for both C101 and C105."

Chemistry C101. The numbers of freshmen who took the Chemistry Achievement Test and who received grades in Chemistry C101, along with the zero-order correlations among the predictor and criterion variables for these students are presented in Tables 21 and 22.

It should be noted that the number of men reported is rather low to allow full confidence in the results. For both sexes, HSR had the highest zero-order correlation with Chemistry C101 grades while the Chemistry Test was third highest for men but almost as high as HSR for women.

When the data on this group of students were submitted to multiple correlation analysis, additional variance accounted for was obtained and is also presented in Tables 21 and 22.

TABLE 21. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING GRADE EARNED IN CHEMISTRY C101 AS THE CRITERION WITH SAT, HSR, AND THE CHEMISTRY TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 48)

	SAT VERBAL	SAT MATH	CHEMISTRY	HIGH SCHOOL RANK	SAT SUM
CHEMISTRY C101	.328	.267	.329	-.425	.340

MULTIPLE CORRELATIONS (N = 48)

			R	CHEMISTRY C101 Increase in R^2
1.	Equal priority to all variables:	HSR	.425	.1804
		SAT V	.536	.1072
		CHEM	.565	.0321
		SAT M	.566	.0005
2.	Equal priority to HSR, SAT V, SAT M; lower priority to CHEM:	HSR	.425	.1804
		SAT V	.536	.1072
		SAT M	.537	.0004
		CHEM	.566	.0321
3.	Equal priority to HSR and SAT SUM; lower priority to CHEM:	HSR	.425	.1804
		SAT SUM	.516	.0858
		CHEM	.547	.0333

TABLE 22. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING GRADE EARNED IN CHEMISTRY C101 AS THE CRITERION WITH SAT, HSR, AND THE CHEMISTRY TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 114)

	SAT VERBAL	SAT MATH	CHEMISTRY	HIGH SCHOOL RANK	SAT SUM
CHEMISTRY C101	.286	.449	.540	-.578	.420

MULTIPLE CORRELATIONS (N = 114)

			CHEMISTRY C101 R	CHEMISTRY C101 Increase in R^2
1.	Equal priority to all variables:	HSR	.578	.3343
		CHEM	.676	.1227
		SAT V	.678	.0028
		SAT M	.680	.0025
2.	Equal priority to HSR, SAT V, SAT M; lower priority to CHEM:	HSR	.578	.3343
		SAT M	.605	.0316
		SAT V	.607	.0024
		CHEM	.680	.0941
3.	Equal priority to HSR and SAT SUM; lower priority to CHEM:	HSR	.578	.3343
		SAT SUM	.591	.0148
		CHEM	.676	.1082

From the results presented in Tables 21 and 22, it can be seen that the Chemistry Achievement Test does add some unique variance to the prediction of Chemistry C101 grades. In the case of men, it adds approximately 3 per cent; for women, between 9.4 and 10.8 per cent. While the results for men were less reliable than those for women, it can be said that the Chemistry Achievement Test is of some value in predicting Chemistry C101 grades. In the case of women, it increases the accuracy of prediction by about one-third.

Chemistry C105. For Chemistry C105, the numbers in each group and the zero-order correlations among the variables are presented in Tables 23 and 24.

The low number of women in Chemistry C105 makes their results less reliable than those for men. For men, HSR had the highest correlation with Chemistry C105 grades with the Chemistry Test having one of the lowest correlations. For women, these results were reversed with the Chemistry Test having the highest correlation with Chemistry C105 grades and HSR one of the lower, although still respectable, correlations.

When the data for these students were analyzed by multiple correlations the additional variance accounted for was obtained and is also presented in Tables 23 and 24.

TABLE 23. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING GRADE EARNED IN CHEMISTRY C105 AS THE CRITERION WITH SAT, HSR, AND THE CHEMISTRY TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 227)

	SAT VERBAL	SAT MATH	CHEMISTRY	HIGH SCHOOL RANK	SAT SUM
CHEMISTRY C105	.247	.323	.281	-.489	.341

MULTIPLE CORRELATIONS (N = 227)

			R	CHEMISTRY C105 Increase in R^2
1.	Equal priority to all variables:	HSR	.489	.2392
		SAT SUM	.553	.0662
		CHEM	.573	.0227
		SAT V	.575	.0028
2.	Equal priority to HSR, SAT V, SAT M; lower priority to CHEM:	HSR	.489	.2392
		SAT M	.539	.0516
		SAT V	.554	.0160
		CHEM	.575	.0241
3.	Equal priority to HSR and SAT SUM; lower priority to CHEM:	HSR	.489	.2392
		SAT SUM	.553	.0662
		CHEM	.573	.0227

TABLE 24. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING GRADE EARNED IN CHEMISTRY C105 AS THE CRITERION WITH SAT, HSR, AND THE CHEMISTRY TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 50)

	SAT VERBAL	SAT MATH	CHEMISTRY	HIGH SCHOOL RANK	SAT SUM
CHEMISTRY C105	.282	.498	.540	-.437	.448

MULTIPLE CORRELATIONS (N = 50)

			R	CHEMISTRY C105 Increase in R^2
1.	Equal priority to all variables:	CHEM	.540	.2912
		HSR	.615	.0874
		SAT M	.638	.0289
		SAT V	.644	.0070
2.	Equal priority to HSR, SAT V, SAT M; lower priority to CHEM:	SAT M	.498	.2484
		HSR	.539	.0423
		SAT V	.544	.0051
		CHEM	.644	.1187
3.	Equal priority to HSR and SAT SUM; lower priority to CHEM:	SAT SUM	.448	.2007
		HSR	.510	.0598
		CHEM	.616	.1193

From the results presented in Tables 23 and 24, it can be seen that the Chemistry Test contributed approximately 2.4 per cent unique variance to the prediction for men, the more reliable group. For women, the Chemistry Test is the best predictor among the five variables when allowed to enter the multiple correlation equally with the other variables. It adds almost 12 per cent unique variance to the prediction for women increasing the accuracy of prediction for them by about one-half.

Using the Biology Achievement Test to predict grades

Biology B100. Grades from freshmen who completed B100 and their HSR, SAT, and Biology Achievement Test scores were analyzed in the same manner as the previous achievement tests. The Biology B100 course description is:

> "Principles of biological organization, from molecules through cells and organisms to populations. Emphasis of processes common to all organisms. For students with no professional interest in biology. Not open to those with credit in Botany B101 or Zoology Z103."

The zero-order and multiple correlation coefficients for men and women in B100 are presented in Tables 25 and 26, respectively.

TABLE 25. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN MEN USING GRADE EARNED IN BIOLOGY B100 AS THE CRITERION WITH SAT, HSR, AND THE BIOLOGY ACHIEVEMENT TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 23)

	SAT VERBAL	SAT MATH	BIOLOGY	HIGH SCHOOL RANK	SAT SUM
BIOLOGY B100	.178	.278	.405	-.282	.275

MULTIPLE CORRELATIONS (N = 23)

			R	BIOLOGY B100 Increase in R^2
1.	Equal priority to all variables:	BIOL	.405	.1640
		HSR	.418	.0110
		SAT M	.420	.0010
		SAT V	.420	.0000
2.	Equal priority to HSR, SAT V, SAT M; lower priority to BIOL:	HSR	.282	.0800
		SAT M	.345	.0400
		SAT V	.345	.0000
		BIOL	.420	.0570
3.	Equal priority to HSR and SAT SUM; lower priority to BIOL:	HSR	.282	.0800
		SAT SUM	.325	.0260
		BIOL	.418	.0690

TABLE 26. ZERO-ORDER AND MULTIPLE CORRELATION COEFFICIENTS FOR FRESHMAN WOMEN USING GRADE EARNED IN BIOLOGY B100 AS THE CRITERION WITH SAT, HSR, AND THE BIOLOGY ACHIEVEMENT TEST AS PREDICTOR VARIABLES.

ZERO-ORDER CORRELATIONS (N = 32)

	SAT VERBAL	SAT MATH	BIOLOGY	HIGH SCHOOL RANK	SAT SUM
BIOLOGY B100	.157	.214	.346	-.624	.221

MULTIPLE CORRELATIONS (N = 32)

			R	BIOLOGY B100 Increase in R^2
1.	Equal priority to all variables:	HSR	.624	.3890
		BIOL	.647	.0300
		SAT SUM	.652	.0060
2.	Equal priority to HSR, SAT V, SAT M; lower priority to BIOL:	HSR	.624	.3890
		SAT M	.629	.0070
		SAT V	.630	.0010
		BIOL	.652	.0280
3.	Equal priority to HSR and SAT SUM; lower priority to BIOL:	HSR	.624	.3890
		SAT SUM	.630	.0080
		BIOL	.652	.0280

The number of freshman men and women who took the Biology Achievement Test and who received a grade in B100 was quite low necessitating caution in the interpretation of the obtained results. The Biology Achievement Test correlated highest with B100 grades for men, while HSR correlated highest with B100 grades for women.

The Biology Achievement Test was the best single predictor of Biology B100 grades for men with the other variables adding little to its prediction. The Biology Test added about

6 percent unique variance to the prediction for men students when given lower priority. For women the Biology Achievement Test added approximately 3 percent unique variance to the predictions obtained by HSR alone and in combination with the other predictor variables.

Anatomy A210 and Zoology Z103. The Biology Achievement Test might be expected to have potential as a predictor of success in other related courses. However, the small numbers of students in these courses who also took the Biology Test decrease the probability of getting meaningful results from the multiple correlation procedure. Nevertheless, the zero-order correlations among the predictor variables and course grades in biological science courses are presented in the following table to provide further evidence for the value of the Biology Test.

TABLE 27. ZERO-ORDER CORRELATION COEFFICIENTS FOR FRESHMAN MEN AND WOMEN OF GRADE EARNED IN ANATOMY A210 AND ZOOLOGY Z103 WITH SAT, HSR, AND THE BIOLOGY ACHIEVEMENT TEST AS PREDICTOR VARIABLES.

		SAT VERBAL	SAT MATH	BIOLOGY	HIGH SCHOOL RANK
ANATOMY A210 (N = 189)	r	.270	.233	.396	-.450
	N	(185)	(185)	(41)	(188)
ZOOLOGY Z103 (N = 265)	r	.278	.372	.406	-.434
	N	(255)	(255)	(63)	(261)

From the results presented in Table 27 it can be seen that the Biology Test does correlate well with grades in Anatomy A210 and Zoology Z103. However, the relatively small samples call for qualifications in any conclusions. Anatomy A210 and Zoology Z103 course descriptions are:

> "A210. Introduction to basic structure of human body. Laboratory study of demonstration dissections and other illustrative material."
>
> "Z103. Not open to students with credit in Biology B100. Emphasis on interdependence of all living things. Type forms, e.g., frog, crayfish, earthworm, used to demonstrate general biological principles. Functional aspects of biology, inheritance, development and evolution and their application to human biology."

The Biology Achievement Test correlated .396 with Anatomy A210 grades and .406 with Zoology Z103 grades. These correlations were based on small sample sizes of 41 and 63 respectively, and the correlation coefficients need to be interpreted accordingly. Further, the samples were composed of both men and women which would need to be separated if multiple correlations were computed. Nevertheless, the Biology Achievement Test does seem to be worth additional study as additional data become available.

Using the Literature Achievement Test to predict grades

English L101. The Literature Achievement Test and the other predictor variables were correlated with grades in English L101, the introductory literature course. The results are presented in Table 28.

TABLE 28. ZERO-ORDER CORRELATION COEFFICIENTS FOR FRESHMAN MEN AND WOMEN OF GRADE EARNED IN ENGLISH L101 WITH SAT, HSR, AND THE LITERATURE ACHIEVEMENT TEST AS PREDICTOR VARIABLES.

		SAT VERBAL	SAT MATH	LITERATURE	HIGH SCHOOL RANK
ENGLISH L101 (N = 1146)	r	.415	.277	.406	-.367
	N	(1110)	(1110)	(109)	(1130)

Less than one-tenth of the students enrolled in English L101 had taken the Literature Achievement Test. For this smaller proportion of students the correlation of the Literature Test with English L101 grades was moderate. However, the correlation of the SAT Test was slightly higher and since this latter index is based on nearly all the students in the course, it provides a more reliable index.

The French, German, Spanish, and Latin Reading Tests of the CEEB Achievement Test Battery were previously studied by personnel of the Bureau of Educational Studies and Testing. The results are reported in B.E.S.T. Monograph No. 10, "Modern Language Placement: An Alternative to Testing," 1968. The Mathematics Level I Test was analyzed by B.E.S.T. and the results are presented in Monograph No. 12, "An Analysis of Achievement Behavior in Selected Mathematics Courses," 1969. The remaining CEEB Achievement Tests, European History and Physics, have not been previously studied by the Bureau and were not analyzed in this study since sufficient data were not currently available.

SUMMARY

From time to time, questions are raised concerning the cost benefit comparison of the CEEB Achievement Tests. Obviously these achievement tests involve money, and time and energy on the part of prospective students required to take the tests. Further, university personnel use time and energy to analyze, interpret, and use the scores resulting from the achievement tests.

All prospective students routinely present CEEB Scholastic Aptitude Test scores; namely SAT Math, SAT Verbal, and SAT Sum. A student's rank in his high school graduating class (HSR) is also known.

The primary aim of this study was to determine whether CEEB Achievement Test results (e.g. English Composition, American History, etc.) provide additional information for the prediction of academic success beyond the normal data we accumulate. In short, do the benefits accruing from these additional student personnel data justify the costs involved?

The Junior Division requested personnel of the Bureau of Educational Studies and Testing to study the question of predicting success for Indiana University freshmen who entered in the fall semester of 1968. These freshmen had been requested to report three (3) CEEB Achievement Test scores along with the traditionally required CEEB Scholastic Aptitude Test scores and High School Rank.

The study presents two types of evidence: (1) a prediction of first semester grade point averages (GPA) and (2) a prediction of grades obtained in 29 selected courses which typically carry high freshmen enrollments. Numerous correlational analyses are presented for the benefit of the meticulous and mathematically inclined reader.

Briefly, our findings and conclusions are the following:

Predicting Total Grade Point Average

1. The English Composition and American History Achievement Tests contribute relatively little (less than 3 per cent) to the prediction of first semester grade point averages. These

two achievement tests were studied because a sufficiently large number of 1968 freshmen had elected to submit these particular test scores as part of their admission data. Thus, on the basis of predicting academic success, there seems to be insufficient reason for requiring these two achievement tests.

Predicting Individual Course Marks

2. The following summary shows the gain in predictive information for 5 courses, using the English Composition Achievement Test:

	Men	Women
English W131	<2%	5%*
English L101	<2%	<2%
Education F100	<2%	<2%
Psychology P101	1%	1%
Speech S121	3-4%*	1%

Thus only two (2) of the ten (10) indices suggest the wisdom of continuing to use the English Composition Test as a predictor of specific course marks (based on the 5 courses listed above).

3. The following summary displays the gain in predicting information for 2 courses, using the American History Achievement Test:

	Men	Women
History H105	8-10%*	5-7%*
Sociology S161	<2%	3-4%*

One may conclude that 3 of the 4 indices shown above suggest the continuance of the History Test.

4. This tabular summary reveals the gain in predictive information for 2 courses, using the Chemistry Achievement Test.

	Men	Women
Chemistry C101	3±%*	9-11%*
Chemistry C105	2 %	12%*

Apparently women are more predictable than men! This test is probably worth continuing for prediction of success in these two chemistry courses.

5. The Biology Achievement Test results were correlated with success in 3 courses. The per cent of increase in variance accounted for is as follows:

	Men	Women
Biology B100	6-7%*	3%

Although the Biology Test also correlates well with grades in Anatomy A210 and Zoology Z103, the relatively small samples demand highly qualified conclusions. Further, only 23 men comprise the sample revealing the 6-7% increase in prediction of B100 marks.

Thus, the authors are reluctant to make any firm generalization about the utility of the Biology Achievement Test.

6. The English Literature Achievement Test was used to predict achievement in English L101. Although this correlation was moderately high, the correlation of English L101 grades with SAT Verbal test results was higher.

Finally, the mixed results obtained in this study suggest a thoughtful review of the practice of requiring CEEB Achievement Tests for admission to the University. In many instances, very little significant prediction information is added to that already available from scholastic aptitude test results and high school rank.